REMARKS

The Examiner and the Primary Examiner are thanked for the courtesy extending to applicants' attorney during the telephone interview of May 5, 2011, during which time the amendments to claims 1, 13 and 14 were discuss to overcome the rejections under 35 USC 103(a) as being unpatentable over Kawasaki et al in view of Stetson. As the result of the interview the agreement was reached that proposed claim amendments, as discussed, would overcome the prior art of records with respect to claims 1, 13 and 14. The Examiner also pointed out that proposed amendments would require further search and consideration and therefore an RCE must be filed with the amendment.

Accordingly, by the present amendment, with the accompanying RCE, independent claims 1, 13 and 14 have been amended to further clarify features of the present invention in a manner suggested by the Examiner. Claims 6, 9, 10 and 17 have been amended to overcome claim objections in a manner suggested by the Examiner.

More particularly, claim 1 has been amended to recite in relevant part: "...a signal selecting means for selecting specified component signals based on correlation values between component signals and a pre-determined reference signal that represents a characteristic of living-body reaction of the examined object..." (emphasis added). Independent claims 13 and 14 have been amended to recite similar features and these features are described, by way of example only, in paragraphs [0025]-[0028], [0039], [0047] and [0051]-[0053] of the specification and illustrated in FIGS. 1-9.

As illustrates in FIG. 1, the signal processing unit 30 separates noise from the

hemoglobin change signals and reconstruct (restore) the hemoglobin change signals by using noise-removed components. As illustrated in FIG. 4, the noise separation comprises mainly a processing 401, which separates the hemoglobin amount change signals into components and display them, a processing 402, which removes specified components of displayed components as noise components or select specified components for the use in the reconstruction, and a processing 403, which reconstructs the hemoglobin amount change signals by using the noise-removed components or the components selected for the use in the reconstruction. The optical measurement apparatus for living body displays the hemoglobin amount change signals as the time course waveforms as shown in FIG. 3, analyzes these waveforms, as required, identifies the sites most reactive to the task loaded and assesses cerebral diseases and others based on the characteristics of the response waveforms of the subject (processing 406).

In the present invention, a step 401, which separates the hemoglobin amount change signals into components, adopts a principal component analysis or independent component analysis, and conduct the separation by selecting either of them or combining them.

These principal component and independent component analyses are the component analysis technique whose algorithm has been established in the multi-variance analysis, and in the optical measurement apparatus of this embodiment a software for implementing the algorithm is built in at the signal processing unit 30 to perform said analysis by selecting either of the two or combining the two, as appropriate, through a user interface (GUI) at the input/output unit 33.

Furthermore, as illustrated in FIG. 6, when a button 605 (Auto) for selecting

automatic processing is operated, a screen for setting criteria for selecting component waveforms to be used in the reconstruction of waveforms is displayed. An example of the screen for setting selection criteria is shown in FIG. 7. In the illustrated example, either or both of two methods, (1) selecting the waveforms highly correlated with a reference waveform 701 and (2) selecting the waveforms with small standard deviations of differential waveform is used selectively or in combination.

As the reference waveform 701, the waveform empirically known as a signal (task-related signals or representative signals) that represents the characteristics of living body reactions to the task loaded during the measurement to the subject during measurement is used. In the illustrated embodiment of this invention, a basic trapezoidal reference waveform 701 is displayed, which users can transform appropriately according to the measurement conditions then or measured waveforms.

For example, by inputting figures in a delay time input box 704, a trapezoid which can emerge at the inputted time, is formed. Further, by moving two vertical lines 702 and 703, which represent the length of time while task is loaded (section of stimulation), the interval between stimulating sections and the stable section before and after the stimulating section can be set up. By inputting a correlation value in the distinctive correlation value box 705 after thus, producing the reference waveform 701, and operating an OK button 707, the component waveform whose correlation value with this reference waveform is higher than the inputted correlation value can be selected.

Furthermore, as illustrated in FIG. 9, when a selection button 906 (Auto) for selecting automatic processing is operated, a screen (FIG. 7) for setting criteria for

selecting component waveforms to be used in reconstructing waveforms is displayed, as in the case of principal component analysis. By setting reference waveforms and inputting necessary parameters according to the display on the screen, the selection of automatic component waveforms by the signal processing unit 30 is implemented.

According to the present invention, the noise separation procedure by the component analysis of measured signals including hemoglobin amount change signals measured in the optical measurement can effectively remove noises regardless of the characteristics of the noise and obtain high-precision target signals.

Applicants submit that the aforementioned features of the independent and the dependent claims are not disclosed or taught in the cited art, as will become clear from the following discussion.

As to the rejection of Claims 1-6 and 8-19 under 35 U.S.C. §103(a) as being unpatentable over Kawasaki et al., U.S. Patent No. 7,463,916 in view of Stetson, U.S. Patent No. 6,701,170, such rejection is traversed insofar as it is applicable to the present claims, and reconsideration and withdrawal of the rejection are respectfully requested.

Kawasaki (US 7,363,916 B2) discloses an optical measurement apparatus, which finds temporal-change distribution of signals based on the positional relation of two measurement points of signals. In the portion (column 8, lines 45-53) on which the examiner relies for regarding previously canceled claim 7 in the Office Action dated October 21, 2010, of the invention as obvious, the followings are taught: "if a representation of the correlation between the living-body transillumination intensity signals at each measuring position is commanded from the console, the processing

means 19 calculates a correlation value from the living-body transillumination signals at each measuring position and the predetermined standard values stored in the storing means 28, and it displays a numerical value or a graph of the thus obtained correlation value. This allows an examiner to objectively determine the location of every kind of function area, which has been conventionally determined by the examiner's subjective reading of the display." Here, Kawasaki only teaches that the processing means calculates a correlation between each signal and a standard value and displays the correlation. It does not teach signal selecting means which selects specified component signals among the multiple component signals based on correlation with a pre-determined reference signal that represents a characteristic of living-body reaction of the examined object, as recited in the independent claims of the application.

With respect to Stetson, first of all, the Examiner mentioned Stetson's teaching concerning signal processing using PCA/ICA. Such signal processing corresponds to signal separating means of the present invention. Stetson does not teach the signal selecting means of the invention, i.e., a signal selecting means for selecting specified component signals based on correlation values between component signals and a pre-determined reference signal representing a characteristic of living-body reaction of the examined object.

Examiner contends that it is inherent from the teaching of Stetson that the desired components have been selected before being reconstructed and it is known to select a specified component among mixture signals by using ICA and/or PCA to remove a noise component as taught by Stetson. However, irrespective of contention by the Examiner, the signal selecting means of the invention is that

selects specified components signals based on correlation values between component signals and a pre-determined reference signal. It is an important and distinguishable point that the correlation is not correlation among mixed signals but correlation between components and a pre-determined reference signal, which is a representative signal showing a characteristic of living-body reaction of the examined object (see paragraphs 0039, 0047 of the specification).

In the pulse oximetry of Stetson, a first independent component 410 is recognized as one corresponding more with noise since it has a low amplitude, which is followed by a high amplitude, whereas a second principal component 420 recognized as one corresponding less with noise (corresponding to a pulse component) since it does not show a distinct high amplitude portion (column 7, lines 5-12). That is, if one of the components is selected to obtain the plethysmographic signal in Stetson, the selection would be based on whether the component shows the high amplitude portion or not. On the other hand, the signal selecting means of the present invention selects specified components based on correlation between component signals and a pre-determined reference signal representing a characteristic of living-body reaction of the examined object. Stetson does not teach such a signal selecting means or a reference signal to be compared with components signals obtained by using PCA/ICA.

The above-mentioned configuration of the invention cannot be made even by combining Kawasaki with Stetson, and the technical objects of the invention cannot be attained by the combination of Kawasaki and Stetson. Thus, both Kawasaki and Stetson fail to disclose or teach: "...a signal selecting means for selecting specified component signals based on correlation values between component signals and a pre-determined reference signal that represents a characteristic of living-body

reaction of the examined object..." (emphasis added), as recited in the independent claims of the application. Accordingly, applicants submit that the independent and the dependent claims patentably distinguish over Kawasaki or Stetson, taken alone, or in any combination threover and should be considered allowable over the combination of the cited art.

In view of the above amendments and remarks, applicants submit that all claims present in this application should now be in condition for allowance and issuance of an action of a favorable nature is courteously solicited.

If the Examiner believes that there are any other points which may be clarified or otherwise disposed of either by telephone discussion or by personal interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Antonelli, Terry, Stout & Kraus, LLP Deposit Account No. 01-2135 (Docket No. 1070.46175X00), and please credit any excess fees to such deposit account.

Respectfully submitted,
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